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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/687,458
Filing Date: October 15, 2003
Appellant(s): KUBISTA ET AL.

Paul Parker
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 16, 2007 appealing from the Office action mailed May 8, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,402,806	SCHMITT	6-2002
6,022,483	ARAL	2-2000

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 16-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schmitt; John Vincent et al. (US 6,402,806 B1) in view of Aral; Gurcan (US 6,022,483 A). Schmitt teaches Schmitt's system (Figure 5; column 2, lines 15-35; column 6, line 7 - column 7, line 28) for depositing material onto Schmitt's workpiece ("substrate"; column 1, lines 17-25) in Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28), Schmitt's system (Figure 5; column 2, lines 15-35; column 6, line 7 - column 7, line 28) comprising: Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28); Schmitt's mainline (503; Figure 5) coupled to Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28), Schmitt's mainline (503; Figure 5) having Schmitt's first branchline (between 503 and 507; Figure 5) and Schmitt's second branchline (between 503 and 509; Figure 5) each downstream from Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28); Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28) in Schmitt's first branchline (between 503 and 507; Figure 5) to collect byproducts from Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28); Schmitt's second trap (513; Figure 5; column 6, line 7 - column 7, line 28) in Schmitt's second branchline (between 503 and 509; Figure 5) to collect byproducts from Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28); Schmitt's pressure monitor (519; Figure 5; column 6, line 7 - column 7, line 28) to

determine a pressure difference between a pressure in Schmitt's mainline (503; Figure 5) upstream from Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28) and Schmitt's pressure in Schmitt's mainline (503; Figure 5) downstream from Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28); Schmitt's vacuum pump ("Pump"; Figure 5; column 6, line 7 - column 7, line 28) coupled to Schmitt's mainline (503; Figure 5) – claim 16

Schmitt further teaches:

i. Schmitt's system (Figure 5; column 2, lines 15-35; column 6, line 7 - column 7, line 28) of claim 16 wherein: Schmitt's mainline (503; Figure 5) further includes Schmitt's third branchline (between 511 and "Pump"; Figure 5) and Schmitt's fourth branchline (between 517 and "Pump"; Figure 5) each downstream from Schmitt's first and second branchlines; Schmitt's vacuum pump ("Pump"; Figure 5; column 6, line 7 - column 7, line 28) comprises Schmitt's first vacuum pump ("Pump"; Figure 5; column 6, line 7 - column 7, line 28) coupled to Schmitt's third branchline (between 511 and "Pump"; Figure 5) - claim 18

ii. Schmitt's system (Figure 5; column 2, lines 15-35; column 6, line 7 - column 7, line 28) for depositing material onto Schmitt's workpiece ("substrate"; column 1, lines 17-25) in Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28), Schmitt's system (Figure 5; column 2, lines 15-35; column 6, line 7 - column 7, line 28) comprising: Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28); Schmitt's mainline (503; Figure 5) coupled to Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28), Schmitt's mainline (503; Figure 5) having Schmitt's first branchline (between 503 and 507; Figure 5) and Schmitt's second

branchline (between 503 and 509; Figure 5) each downstream from Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28); Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28) in Schmitt's first branchline (between 503 and 507; Figure 5) to collect byproducts from Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28); Schmitt's second trap (513; Figure 5; column 6, line 7 - column 7, line 28) in Schmitt's second branchline (between 503 and 509; Figure 5) to collect byproducts from Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28), Schmitt's pressure monitor (519; Figure 5; column 6, line 7 - column 7, line 28) to determine a pressure difference between a pressure in Schmitt's mainline (503; Figure 5) upstream from Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28) and a pressure in Schmitt's mainline (503; Figure 5) downstream from Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28); Schmitt's vacuum pump ("Pump"; Figure 5; column 6, line 7 - column 7, line 28) coupled to Schmitt's mainline (503; Figure 5); – claim 20

iii. Schmitt's system (Figure 5; column 2, lines 15-35; column 6, line 7 - column 7, line 28) of claim 20 wherein: Schmitt's mainline (503; Figure 5) further includes Schmitt's third branchline (between 511 and "Pump"; Figure 5) and Schmitt's fourth branchline (between 517 and "Pump"; Figure 5) each downstream from Schmitt's first and second branchlines; Schmitt's vacuum pump ("Pump"; Figure 5; column 6, line 7 - column 7, line 28) comprises Schmitt's first vacuum pump ("Pump"; Figure 5; column 6, line 7 - column 7, line 28) coupled to Schmitt's third branchline (between 511 and "Pump"; Figure 5) - claim 22

Schmitt does not teach:

i. a throttling valve in Schmitt's second branchline (between 503 and 509; Figure 5) – claim 16, 20

ii. a controller operably coupled to Schmitt's pressure monitor (519; Figure 5; column 6, line 7 - column 7, line 28) and a throttling valve, a controller having a computer-readable medium containing instructions that cause the controller to perform Schmitt's method comprising--exhausting byproducts from Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28) through the first trap (501; Figure 5; column 6, line 7 - column 7, line 28) in the first branchline (between 503 and 507; Figure 5); determining the pressure difference across the first trap (501; Figure 5; column 6, line 7 - column 7, line 28) caused by a flow of the byproducts by monitoring the Schmitt's pressure monitor (519; Figure 5; column 6, line 7 - column 7, line 28); dynamically controlling Schmitt's flow of byproducts into the second trap (513; Figure 5; column 6, line 7 - column 7, line 28) in Schmitt's second branchline (between 503 and 509; Figure 5) by regulating the throttling valve; and to maintaining Schmitt's pressure differential across the first trap in Schmitt's mainline (503; Figure 5) based on the determined presssure difference - claim 16

iii. Schmitt's system (Figure 5; column 2, lines 15-35; column 6, line 7 - column 7, line 28) further comprises a second vacuum pump coupled to Schmitt's fourth branchline (between 517 and "Pump"; Figure 5) - claim 18, 22.

iv. Schmitt's system (Figure 5; column 2, lines 15-35; column 6, line 7 - column 7, line 28) of claim 16 wherein a throttling valve comprises Schmitt's first valve (505; Figure 5;

column 6, line 7 - column 7, line 28), and wherein Schmitt's system (Figure 5; column 2, lines 15-35; column 6, line 7 - column 7, line 28) further comprises Schmitt's second valve (511; Figure 5; column 6, line 7 - column 7, line 28) in Schmitt's first branchline (between 503 and 507; Figure 5) upstream of Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28) and a third valve in Schmitt's first branchline (between 503 and 507; Figure 5) downstream of Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28), as claimed by claim 19

v. a controller operably coupled to Schmitt's pressure monitor (519; Figure 5; column 6, line 7 - column 7, line 28) and a throttling valve, a controller having a computer-readable medium containing instructions that cause the controller to perform Schmitt's method comprising--exhausting byproducts from Schmitt's reaction chamber (521; Figure 5; column 6, line 7 - column 7, line 28) through Schmitt's branchline; collecting byproducts in Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28) in Schmitt's first branchline (between 503 and 507; Figure 5); monitoring Schmitt's difference between Schmitt's pressure in Schmitt's mainline (503; Figure 5) upstream of Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28) and Schmitt's pressure in Schmitt's mainline (503; Figure 5) downstream of Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28); and regulating a throttling valve in Schmitt's second branchline (between 503 and 509; Figure 5) in response to Schmitt's monitored pressure differential in Schmitt's mainline (503; Figure 5) to flow byproducts into Schmitt's second branchline (between 503 and 509; Figure 5) and maintaining the

pressure differential in Schmitt's mainline (503; Figure 5) within Schmitt's desired range by regulating the throttle valve, - claim 20

vi. Schmitt's system (Figure 5; column 2, lines 15-35; column 6, line 7 - column 7, line 28) of claim 20 wherein a throttling valve comprises Schmitt's first valve (505; Figure 5; column 6, line 7 - column 7, line 28), and wherein Schmitt's system (Figure 5; column 2, lines 15-35; column 6, line 7 - column 7, line 28) further comprises Schmitt's second valve (511; Figure 5; column 6, line 7 - column 7, line 28) in Schmitt's first branchline (between 503 and 507; Figure 5) upstream of Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28) and a third valve in Schmitt's first branchline (between 503 and 507; Figure 5) downstream of Schmitt's first trap (501; Figure 5; column 6, line 7 - column 7, line 28), as claimed by claim 23

Aral teaches a wafer processing apparatus (Figure 1; column 3, line 34 - column 3, line 35) including exhaust control apparatus (Figure 4; column 6, line 13 – column 10, line 40) comprising a controller (Figure 4) for controlling a throttle valve (118; Figure 1) for controlling processing chamber pressure (column 2; lines 40-58) based on pressure differences (Equation 3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Aral's exhaust control apparatus to Schmitt's system.

Motivation to add Aral's exhaust control apparatus to Schmitt's system is for controlling to Schmitt's reactor pressure as taught by Aral (column 1; lines 9-26). Further, it is well established that the duplication of parts is obvious (In re Harza , 274 F.2d 669, 124 USPQ 378 (CCPA 1960) MPEP 2144.04).

(10) Response to Argument

Applicant states:

"

One of ordinary skill in the art would not modify Schmitt's system as suggested by the Examiner because, among other reasons, Schmitt teaches away from combining with Aral. In the May 8 Final Office Action, the Examiner stated "[M]otivation to add Aral's exhaust control apparatus to Schmitt's system is for controlling Schmitt's reactor pressure as taught by Aral." (Office Action, May 8, 2006, page 7). However, this rationale ignores explicit teachings in Schmitt against such a modification. In particular, such a modification would change the principle of operation of Schmitt's system. Schmitt discloses a bypass trap parallel to a primary trap to allow either trap to be removed and replaced without unduly disrupting the product flow through the processing chamber. Thus, Schmitt's bypass trap is designed to operate as a backup for the primary trap during normal operation. If Schmitt's bypass trap were used with Aral's throttling valve to maintain a desired pressure drop across the primary trap, Schmitt's backup trap would be operating concurrently with the primary trap instead of being a standby backup in direct opposition to Schmitt's teachings.

"

and...

"

In addition, such a modification would render Schmitt's system unsatisfactory for its intended purpose. One of Schmitt's design goals is to avoid unduly disrupting the product flow through the processing chamber. As a result, Schmitt discloses alternatively operating the primary and

backup traps so that when one trap is serviced, the other can keep the deposition process operating.

"

In response, Applicant is mistaken when arguing the Examiner's rationale ignores explicit teachings in Schmitt against such a modification. In particular, Applicant states that such a modification would change the principle of operation of Schmitt's system. The Examiner believes that both Schmitt and Aral each teach numerous common goals and themes shared by them and all inventors in the field of vacuum chamber processing of which both Schmitt and Aral are in common. In particular, and in full agreement with Applicant's analysis of Schmitt, Schmitt's plural traps are provided to ensure uninterrupted vacuum processing as the on-line trap loads with particulates (see Schmitt: column 6; lines 36-58). According to Schmitt, the trap changeover occurs when Schmitt's pressure sensor (519; Figure 5) displays/records an unacceptable pressure *increase*. The Examiner notes that from standard and well known fluid flow concepts, which both Schmitt and Aral illustrate implicitly, that while Schmitt's online trap loads and Schmitt's pressure sensor (519; Figure 5) displays/records an unacceptable pressure *increase*, then such a pressure *increase* would thus cascade back into Schmitt's process chamber 521 according to Schmitt's apparatus configuration rendering the CVD process pressure outside its optimal range of *vacuum* processing. Such a pressure *increase in Schmitt's process chamber* 521 would result in at least unacceptable CVD deposited films as well as caking of material in Schmitt's process chamber walls due to the increased partial pressure of the reactants entering Schmitt's process chamber.

In conjunction with the inherent desire of Schmitt to control Schmitt's process chamber pressure, as argued above, Aral also clearly shares such a goal as is repeatedly discussed throughout the Aral patent:

"

A system *for controlling the pressure in a chamber* with a computer controlled exhaust throttle valve. A characterization relationship describes the static properties of the valve geometry, valve actuation mechanism and gas flow properties. This characterization relationship can comprise a theoretical ....

" (Abstract)

As a result, Applicant's contention that "such a modification would change the principle of operation of Schmitt's system." is unfounded. Further, in response, the Examiner notes that Applicant's position that "If Schmitt's bypass trap were used with Aral's throttling valve to maintain a desired pressure drop across the primary trap, Schmitt's backup trap would be operating concurrently with the primary trap instead of being a standby backup in direct opposition to Schmitt's teachings" conflates the Examiner's stated rationale for the Examiner's proposed combination: " It ... to add Aral's exhaust control apparatus to Schmitt's system." and the Examiner's above-supported position that both Aral and Schmitt collectively share the same goals for the operation of there respective apparatus. As a result the Examiner's proposed motivation to add Aral's exhaust control apparatus to Schmitt's system is for controlling to Schmitt's reactor pressure as taught by Aral (column 1; lines 9-26) is supported by both Schmitt and Aral. In support of the Examiner's interpretation of Schmitt and Aral, Applicant himself notes that "one of Schmitt's design goals is to avoid unduly disrupting the product flow through

the processing chamber" which goes hand in hand with ensuring a desired operating pressure in Schmitt's apparatus *because "product flow through the processing chamber"*, if inhibited by a loaded trap, would *increase* the operating pressure upstream of Schmitt's apparatus which Aral, and Schmitt, intend to control.

Applicant further states:

"

If Schmitt's bypass trap were used with Aral's throttling valve to operate jointly with the primary, trap, the product flow through Schmitt's processing chamber would be unduly disrupted because both traps must be serviced at the same time after sufficient byproducts have been collected. As a result, Schmitt's processing chamber cannot continue to operate because the path for the product flowing from the processing chamber is now blocked. Thus, disruption to the product flow through Schmitt's processing chamber cannot be avoided. Accordingly, the proposed modification would render Schmitt's system unsatisfactory for its intended purpose of having undisrupted flow through the processing chamber.

"

In response, the Examiner does not advocate in his 103 rejection that Schmitt's bypass trap is to be used with Aral's throttling valve. In contrast, the Examiner's explicit rejection states "It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Aral's exhaust control apparatus to Schmitt's system." The Examiner's statement then implies the *opposite* of what Applicant suggests which is that Aral's throttling valve is to be used with Schmitt's apparatus. Further, Applicant's contention that upon adding Aral's exhaust control apparatus to Schmitt's apparatus would unduly disrupt Schmitt's processing chamber because

"both traps must be serviced at the same time after sufficient byproducts have been collected" is antithetical to Schmitt's operation which is to simply switch over to the unloaded trap when Schmitt's pressure drop as measured by 519, Figure 5 exceeds a predetermined value. By adding Aral's exhaust control apparatus in any portion of Schmitt's apparatus downstream of Schmitt's chamber, as taught by Aral, would produce the stated benefits as explicitly taught by Aral (column 1; lines 9-26). Schmitt does not teach concurrent operation of Schmitt's traps as suggested by Applicant.

Applicant states:

"

Even if Schmitt and Aral were combined as suggested by the Examiner, the combined teachings of Schmitt and Aral fail to disclose or suggest several features of claim 16. For example, the combined teachings of Schmitt and Aral fail to disclose or suggest "a throttling valve in the second branch line" of claim 16. Instead, Schmitt discloses a block valve in the second branch line upstream of the backup trap, and Aral does not disclose any trap branch line at all. Thus, if the teachings of Schmitt and Aral were to be combined, the resulting system would include Aral's exhaust throttling valve at the discharge of Aral's process chamber, and such a location would be upstream of Schmitt's primary and bypass traps instead of in any of these branch lines. As a result, the combined teachings of Schmitt and Aral still do not disclose or suggest "a throttling valve in the second branch line."

"

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on

combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant further states:

"

Moreover, the combined teachings of Schmitt and Aral fail to disclose or suggest a controller that includes a computer-readable medium containing instructions that cause the controller to perform a method that includes "dynamically controlling the flow of byproducts into the second trap by regulating the throttling valve," as recited in claim 16. Instead, Schmitt teaches operating only one trap at a time. Specifically, Schmitt discloses "during normal operation, the primary inlet valve 505 and the primary outlet valve 511 of the primary cold trap are open, while the bypass inlet valve 515 and bypass outlet valve 517 are closed." (Schmitt at column 6, lines 36-39). "The effluent path is generally not switched during a CVD wafer deposition process, but is switched after a wafer deposition process has finished and before the next [process] has started." (Schmitt at column 6, lines 54-57). Thus, the exhaust from Schmitt's process chamber would not be admitted into the bypass trap because during normal operation, "the bypass inlet valve and the bypass outlet valve are closed." Aral does not teach or suggest having traps between the exhaust throttle valve and the vacuum pump. As a result, the combined teachings of Schmitt and Aral do not disclose or suggest controlling the flow of byproducts into the second trap.

"

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on

combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Further, Applicant's position that Schmitt teaches operating only one trap at a time *supports* the Examiner's proposed combination! Aral's controller (114; Figure 4) applying computer-readable medium containing instructions that cause the controller (114; Figure 4) to perform a method that includes dynamically controlling the flow of byproducts from Aral's vacuum chamber 112 and then through Aral's throttling valve 118 would be considered as a beneficial addition by one of ordinary skill in the art to the apparatus of Schmitt. By adding two or even one of Aral's pressure control system (Figure 4), Schmitt's apparatus would benefit from the very favorable vacuum chamber pressure control as taught by Aral (column 1; lines 9-26).

Applicant states:

"

In addition, the combined teachings of Schmitt and Aral fail to disclose or suggest a controller that includes a computer-readable medium containing instructions that cause the controller to perform a method that includes "maintaining the pressure differential across the first trap in the mainline within a desired range based on the monitored pressure difference." Instead, Aral teaches monitoring and maintaining the pressure (instead of a pressure difference) in the process chamber based on the monitored process chamber pressure, and Schmitt discloses monitoring whether the pressure differential across the primary cold trap exceeds a preset threshold. Thus, neither references disclose or suggest maintaining the pressure differential across the traps, which is not the pressure in the reaction chamber.

"

and..

"

One of ordinary skill in the art would not be motivated to modify Schmitt's system as suggested by the Examiner because Schmitt teaches away from combining with Aral as described above with reference to Group I. Further, even if Schmitt were combined with Aral, the combined teachings of these references still fail to disclose or suggest several features of claim 20. For example, in addition to the arguments discussed above with respect to Group I, neither Schmitt nor Aral disclose "a controller ... having a computer-readable medium containing instructions that cause the controller to perform ... regulating the throttling valve in the second branch line in response to the monitored pressure differential in the mainline..." Instead, Aral's throttling valve is regulated to maintain the pressure in the process chamber based on the monitored process chamber pressure, and Schmitt's pressure differential across the primary cold trap is not used as a process variable at all. Further, neither Schmitt nor Aral disclose "maintaining the pressure differential in the mainline within a desired range by regulating the throttling valve." Schmitt discloses monitoring the pressure differential as an indicator for a clogged trap, not maintaining the pressure differential.

"

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Further, the Examiner has already demonstrated that Schmitt teaches the method of "maintaining the pressure differential (519;

Figure 5) across the first trap (501 or 513; Figure 5) in the mainline within a desired range based on the monitored pressure difference (Schmitt: "selected limit", column 6; lines 40-50)."

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Rudy Zervigon (Primary Examiner, Art Unit 1763)

5/14/7

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